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A Department of Epidemiology
For Army Divisions.

1921

J G Brown

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A Department of Epidemiology for Army Divisions.

At the beginning of the World War, few problems confronting the Army Medical Department were more pressing or more difficult of solution than that of the control of infectious diseases in army camps.

The concentration of large bodies of young men from all sections of the country, in hastily improvised concentration camps, under war conditions, made the rapid spread of communicable diseases among them inevitable. Experienced Epidemiologists were hard to obtain; how hard, could probably have been demonstrated in no other way than by the exactions of war. The services of a few Health Officers from large cities and of a few graduates and teachers from recently established schools of public health were available but the supply of officers of this calibre was extremely limited and was soon exhausted. Most of the epidemiological work had to be done by the already over-taxed Division Surgeon, assisted in emergencies by the Bureau of Laboratories.

The War Department is now going through a stock-taking and reorganization process, as a result of the lessons of the war. The lessons learned in Preventive Medicine have led to a greatly increased development of epidemiological work in the Medical Department.

Strictly speaking, Epidemiology is the science of epidemic diseases, but in its broader application and as the term is now generally understood, it is not limited to epidemic or even to contagious diseases but is made to include the study of morbidity from all causes. It is, in effect, the application of the Principles of the Practice of Medicine to communities, rather than to individuals. It has been described as the connecting link between

clinical and experimental medicine, on the one hand and Vital Statistics, on the other, Experimental medicine dealing with the development of medical science and Vital Statistics serving as a sort of clinical thermometer for the registering of the various changes and reactions of populations.

Epidemiology is essentially a new subject. Parts of it, of course, are as old as the history of medicine but its modern development is based largely upon comparatively recent studies in bacteriology and immunology.

A few medical schools are now teaching Preventive Medicine as a specialty and the scattered literature pertaining to it is being assembled. It may be that future applicants for commission in the Army Medical Corps will be trained Epidemiologists but, for the present at least, it is necessary to study this subject within thearmy.

Organization.

For the purpose of this paper, the Division, in time of peace, is taken as a basis of study, as the Division is the principal large administrative unit of the army, and peace conditions are more favorable for study and experiment.

According to the proposed new tables of organization, the Division will consist of about II,500 men in time of peace and about 20,000, in time of war.

The Division Surgeon is the chief medical officer. His principal assisstants are the Assisstant Division Surgeon, the Sanitary Inspector and the Laboratory Officer. The Dental Surgeon and the Veterinary Surgeon, although belonging to separate corps, are closely connected with his office.

At large camps, the hospital and attached laboratory may or may not be divisional units but they are usually placed under the control of the Division Surgeon.

The duties of a Division Surgeon are in part analogous to those of a City Health Officer. In addition, he is Commanding Officer of a medical regiment and is a member of the staff of the Division Commander.

The Assistant Division Surgeon is first assisstant to the Division Surgeon. He generally has charge of matters of administrative routine.

The Sanitary Inspector makes regular inspections of barracks, quarters and grounds. He examines into the quality of the food and water supply, clothing, disposal of wastes, and the sanitary surroundings of the soldier and camp in general. He reports to the Division Surgeon. It is understood that it it is now intended to make Epidemiology an established department of the work of the Sanitary Inspector.

The Laboratory Officer has charge of the Laboratory Section of the Medical Regiment. He is equipped with complete portable equipment and is given ready access to the large corps laboratories.

The epidemiological work is now scattered throughout several different offices and departments, the Division Surgeon's office, the Sanitary Inspector's office, the hospital and laboratory. The proposal to make it a part of the Sanitary Inspection Department, is a step in the right direction, in that it will enable the epidemiological work to be assembled in one office and under one head but, if the work of Sanitary Inspection and Epidemiology is to be combined, it would seem more logical, and would place the emphasis more nearly where it belongs, to make the work of Sanitary Inspection a part of the Department of Epidemiology.

The Department of Epidemiology.

The importance to the army of the study and control of infectious diseases would seem to justify the assignment to each division, of a Division Epidemiologist, who would devote his entire attention to this work. If an additional staff officer cannot be placed on the staff of the Division Surgeon, the duties ordinarily performed by the Assistant Division Surgeon could possibly be assigned to a junior officer.

Two main requirements must be met in the development of a department of epidemiology: first, the training of the Epidemiologist and second, the outlining of the work to be performed.

The main requirements of the Epidemiologist are:

I General knowledge of clinical medicine.
2 A working knowledge of statistical methods.
3 Knowledge of the basic principles of administration.

The work to be performed by the department could be summarized, as follows:

I The prompt recognition of outbreaks of disease
2 The limitation of the spread of infections.
3 The recording and analytical study of disease incidence.

In the training of the Epidemiologist, Statistics and Administration will need to be taught as almost new subjects.

The average medical officer, on entering the service, has received instruction in only the first of the required subjects. He has a knowledge of clinical medicine but knows little or nothing of statistics, and has probably given little thought to the business of handling men or other problems of administration. At the Army Medical School, he is given intensive training in bacteriology and allied laboratory subjects, special instruction in selected

branches of medicine and surgery and is taught something of military administration, particularly in regard to regulations, drill, &c. His training is such as to fit him for the all-round duties of a medical officer. Opportunities for specialization are usually provided later. Without a basic knowledge of statistics and training in executive methods, he cannot properly apply his knowledge of medicine to the study and treatment of populations.

Statistics

According to the classical definitions of Yule:

'By statistics we mean quantitative data affected to a marked extent by a multiplicity of causes.

'By statistical methods we mean methods specially adapted to the elucidation of quantitative data affected by a multiplicity of causes.

'By theory of statistics we mean the exposition of statistical methods.

' The insertion in the first definition of some such words as 'to a marked extent' is necessary, since the term 'statistics' is not usually applied to data like those of the physicist which are affected only by a relatively small residuum of disturbing causes. **** In the problem of molecular physics,*** multiplicity of causes is the essence of the case. The motion of an atom or a molecule in the middle of a swarm is dependent upon that of every other atom or molecule in the swarm.'

The complete theory of statistics is a difficult and complicated science, the complete comprehension and enjoyment of which is reserved for mathematicians. Only the elements of the subject are required, however in Public Health work and these are within the reach of almost any medical officer.

The attempt to master the higher branches would in most cases be useless and would lead only to confusion and discouragement. A superficial knowledge, even of the rudiments, on the other hand would be worse than useless, as it would lead the student to false assumptions and wrong conclusions.

In the words of George C. Whipple, There are some statisticians who are statisticians and there are some statisticians who are mathematicians. There are theories of statistics which comprise a very considerable part of mathematics. Volumes have been written on the Calculus of Probabilities, on Least Squares, on Variation. On the other hand many of the statistical processes are extremely simple and do not get beyond the bounds of ordinary arithmetic. The simple processes have a wide general use; the more elaborate processes have their place but are not commonly applicable or necessary.***** Even at the present time it is safe to say that the most successful health officers are good statisticians, although it does not follow that all good statisticians are successful health officers. "

Statistics is full of pit-falls for the unwary. The popular saying, "anything can be proved by statistics", is probably due to the many grotesque meanings which have been read into columns of figures. The figures themselves may mean anything or nothing; their value lies in their interpretation and in the proper visualization of the facts for which they stand. The Epidemiologist must have sufficient knowledge of statistical methods to collect data with discrimination as to its relevancy and importance and to assemble it in a clear comprehensive and reasonably concise manner.

While the necessary proficiency in this work is not especially difficult of attainment, it is not to be acquired without well directed study.

Administration

Knowledge of the basic principles of Administration is necessary for the practical application of any of any of the principles of Epidemiology. Theoretical knowledge of the modes of spread of diseases and statistical studies of their effects upon populations would be of little use in prevention, if communities could not be made to accept this knowledge or at least conform to its teachings.

The practical applications of Preventive Medicine are not always easy. They will not always be viewed with favor by those having the power of enforcement. They must be often irksome to the individual concerned and attempted evasions are to be expected. The activities of a corps of assistants must often be supervised and coordinated. These and a score of routine problems must be met by the Epidemiologist. He must know when to insist, when to persuade, when to bully and when to yield and he must know how to do each of these things when occasion demands.

The belief is not uncommon that executive ability is in-born; that like certain of the arts, it is a sort of gift of nature which some men receive and others do not and cannot acquire. The success of one administrative officer and the failure of another, working under similar conditions and with similar materials is too often attributed to the difference in their "natural qualities of leadership." It would seem more logical to liken Administration to Mathematics, which some have learned and others have not, and to attribute the sucesses and failures more to the difference in the methods and systems that the Executive Officers employ.

Executive work consists chiefly in the handling of men; those in higher authority, incidentally, but more particularly those who are subordinate. The executive officer may formulate policies, without assistance, but, in carrying them out, he must secure the industry, enthusiasm and loyalty of his subordinates.

There are certain fixed laws of administration which are almost infallible; laws of conduct and laws of method, which if systematically followed, will yield definite results. A book could be written upon this subject, but, unfortunately, one never has been written and beginners go on making the same mistakes in the same places where countless others have made them, until they learned better in the school of experience.

Educational Facilities

This year, for the first time, it has been possible for a few medical officers to attend the recently established Schools of Hygiene and Public Health, attached to large universities but the continuance of this priviledge is problematical, depending as it does upon changeable congressional legislation. In any event, it will be available for only a limited number of individuals. In view of the increasing importance and usefulness of Preventive Medicine, it is necessary that all medical officers be kept familiar with its newer teachings.

The training in epidemiology should be commenced as early as possible in the career of the young medical officer. It would be of advantage to establish a course of study in the subject at the Army Medical School, if only to arouse interest at the start. Some of the elements of statistics might be well taught at this time.

The semi-monthly Medico-Military Review, issued by the Surgeon General's office during the last two years has served a useful purpose in disseminating knowledge of control of epidemic diseases. It would probably have been more useful if medical officers,generally, could have received greater preliminary training in epidemiology. The increased distribution of pamphlets and monographs of medical officers, of a character similar to those issued by the Public Health Service and the stocking of military medical libraries with new literature pertaining to Preventive Medicine would accomplish much toward creating a keener interest and a fuller understanding of this subject.

A greater community of interest and an increased interchange of ideas between military and civilian medical officers is required and is now possible, since military posts are no longer isolated but are, for the most part, now located near large cities.

As laboratory investigations form so important a part of Preventive Medicine, it would seem logical to select Epidemiologists from among the Bacteriologists and Division Surgeons from among the Epidemiologists, but as many Bacteriologists have little taste for Administration and as many good administrators are poor Bacteriologists, the Sanitary Inspector should also be considered in line for promotion to Division Surgeon.

Duties of Epidemiological Department.

It has been said that diagnosis, limitation of spread and the analytical study of disease incidence constitute the chief duties of the department of epidemiology.

The primary diagnoses are usually made by Regimental or Detachment Surgeons, who promptly report the occurrence of notifiable diseases to the Division Surgeon. Many of these diagnoses must be verified by the Epidemiologist. It is of the utmost importance that he be promptly notified of their appearance. As Sir Arthur Newsholme has pointed out, if all the contacts of a first case can be segregated, the spread of contagion from that source can often be immediately checked. If the contacts from the second cases can be segregated, there is still a chance of preventing further spread but when the third crop of contact cases has appeared, the outbreak of the disease has assumed the proportions of an epidemic.

Notification of contagious diseases should be upon prescribed forms, in order that the requisite data of epidemiological significence may be obtained in each instance. This is especially important when the cases cannot be seen by the Epidemiologist, personally. Upon the conclusion of an important case, a second form should be prepared, describing the course, complications and Other developments of interest. (Appendix A)

It will be impossible, in a paper of this scope, to discuss, in detail, the various methods to be used in in limiting the spread of individual diseases. These measures are abundantly described in the literature. To secure uniformity of procedure, the distribution of some such general directions as are contained in the Report of the American Public Health Association Committee on Standard Regulations (Reprint No. 436, U. S. Publis Health Association, Oct. I2,I917.) would be of benefit.

Three Special Problems.

At this time only a few of the general sanitary measures of recent development or which presented problems of interest during the war, namely: isolation of recruits, increased protection of the milk supply and improved methods of washing mess-kits, can be considered.

It has been commonly observed that the arrival of large numbers of recruits is uniformly accompanied by outbreaks of disease in the organizations to which they become attached. In some of the concentration camps in this country, during the war, recruits were kept in separate barracks for a time which would cover the incubation period of the more common acute contagious diseases. The War Department now has under consideration plans to segregate all recruits,for fourteen days, under the supervision of the Medical Department. It would seem that if such a system were followed, many potential epidemics could be strangled at their birth. This period could be used for more detailed examination of recruits and would allow for a weeding-out process. A single physical examination at time of enlistment is necessarily imperfect and may be unreliable, in some cases. Discharge of soldiers on account of physical disability detected after enlistment is now an expensive process and is a source of considerable inconvenience to the service. Opportunities would also be afforded for the collection of important data relating to the previous personal history of soldiers.

It is with some hesitation that a venture is made upon the controversial ground of the milk question but this problem is one of vital importance to the Epidemiologist and is one which does not receive the attention it deserves at many army camps. The inspections of dairies are liable to be perfunctory

and the required reports upon the quality of the milk are not always based upon laboratory examinations.

Milk-borne epidemics are liable to occur in all communities. When the source is recognized, they are usually comparatively easy of control.

The principal diseases transmitted by milk are diphtheria, scarlet fever, typhoid fever, septic sore throat and tuberculosis. In pasteurized milk, the margin of safety is small. Difference of opinion still exists as to the amount of heat which should be applied. Living tubercle bacilli and other pathogenic organisms have been repeatedly found in commercially pasteurized milk. Recent investigations have shown that the reputed losses in nutritive properties, on boiling, have been greatly exaggerated. Changes in tastes and odors can be considerably reduced by boiling the milk in closed containers and aerating it when cooled. Doctor W. W. Ford and others have shown that milk contains certain spore-bearers which resist boiling but these have not been shown to be pathogenic in freshly boiled milk. It is the opinion of the writer that all commercial milk intended for domestic use should be boiled, as has long been the custom in Continental Europe, without deleterious effect so far as known. This is stated as a mere matter of personal opinion. The milk problem is an open question. It well merits the close attention of the Epidemiologist.

The problem of washing the mess-kits in a sanitary manner became a very serious one during the war. Kitchen utensils were scarce and only a few buckets or large cans could be provided per company of 250 men. One soldier would frequently wash his mess-kit in water which had been used by twenty five or fifty, before him. The possibilities of spreading infection, through the saliva, in this manner were enormous. The writer introduced the method of maintaining a receptacle of boiling water over a fire, and required the

men to scald their mess-kits in this, after the preliminary washing had been given. This practice was later followed throughout the army. It is suggested that in the future, mess-kits be numbered and that after each meal they be washed by the soldier and then turned in to the kitchen, to be boiled for ten minutes. They can then be returned to the soldier, according to their respective numbers. There will be few occasions, even in the field, when sufficient fire and water cannot be procured for this purpose. At permanent camps, dishes should be washed by dish-washing machines.

The recent researches of Colonel Lynch and Lieutenant Colonel Cummings have demonstrated, beyo nd question, that pathogenic organisms from saliva and fingers can be made to contaminate eating utensils through the dish water.

Study of Disease Incidence.

In the study of the causation and prevention of disease, both laboratory investigations and mathematical or statistical analyses are employed, illustrating the place of Epidemiology as the connecting link between Experimental Medicine and Statistics.

Through laboratory investigations, bacteria have been isolated, vaccines and anti-toxins discovred, the transmission of disease by insects ascertained and many of the most brilliant achievements of Preventive Medicine have been accomplished. By means of mathematical deductions, based upon observation and experience, on the other hand, the way has been paved for many of the laboratory achievements. It was known that certain diseases were spread by contact before the means of transmission was understood; it had been learned that many intestinal diseases were contracted through drinking-water before the causative organisms had been isolated, and it had been demonstrated that malaria could be prevented by the avoidance of marshy districts before it had been discovered that the disease was transmitted by the mosquito.

In epidemiological investigations, laboratory methods are used for diagnostic purposes, in the examination of foods and water, examination of carriers and the like. Statistical methods are used chiefly in the study of disease incidence and the evaluation of preventive measures .

It is obvious that the Epidemiologist would require detailed records of all the cases of disease occurring in the Division. Great caution is required in collecting these data. O n the one hand, the greatest amount of information obtainable in each instance is desireable, as details which appear trivial in themselves may, in their aggregate, be of the greatest epidemiological importance. On the other hand, the data required must not be so cumbersome and voluminous as to make their accurate collection impracticable. It would seem practicable to keep a medical history of each man in the division, much of the type of the Individual Health Record now in use in the Navy. Some of the data which would be required in these records is suggested in Appendix B.

The record should be started for each soldier at the time of enlistment. Thereafter, additional entries should be made upon the reco rds upon admission to sick report, upon receiving vaccinations or other special treatments, upon change of station &c. The record should be kept by the Regimental Surgeon but it should accompany the soldier upon his transfer to hospital or change of station, as is the case with the descriptive list or service record. A monthly report of entries should be forwarded to the Division Epidemiologist, who should keep himself informed, through the Personnel Adjutant, of all changes in assignments of soldiers.

In the beginning, at least, the record should contain few stereotyped headings, most of the pages being left blank, for the entering of current data. It is suggested that the size be about 4 X 8 inches, enabling it to be enclosed, without folding , in an ordinary official envelope.

By means of these records, factors contributing to the causation of disease could be tabulated and classified and the usefulness of preventive measures could be demonstrated. The conditions common to individuals contracting a disease and absent among those who do not contract it could be readily ascertained. The number of persons escaping infections when protected in a certain way could be counted and compared with the number of unprotected persons that so escape, when exposed under the same circumstances.

In determining susceptibility, cases could be divided into groups, according to age, race, nationality, occupation, previous place of residence, previous health, previous attack, presence or absence of artificial immunization and the countless other factors of epidemiological importance which can be seldom obtained without searching various and multitudinous reports, if they can be obtained at all.

The usefulness of these records as an aid to administrative action could probably be best illustrated by a consideration of some of the epidemiological aspects of an individual disease; Tonsillitis, for example.

Tonsillitis is probably the most prevalent of all the minor diseases of the soldier. It is normally most frequently found among young male adults. During the war, it was fifth among the admissions to sick report, and when taken together with bronchitis, laryngitis and other manifestations of the "common cold", it was third, on the list. It arises from a variety of causes, usually being caused by a micro-organism which enters the system on account of lowered resistence, due to chilling, fatigue, the breathing of impure air &c.

One attack predisposes to another and after repeated attacks, chronic inflammation is liable to ensue. In the chronic forms, accumulations in the crypts give rise to focal infections and the vague disabilities and illnesses which follow in their train. In investigating recorded instance of this disease, the cause will frequently found to be common to many cases and, in the company, will invite attention to examination of ventilation of sleeping quarters, the milk supply, &c. Repeated attacks in the same individual would be noted and would suggest detailed examination of the respiratory tract, dental treatment and in appropriate cases, tonsillectomy.

The uses to which carefully compiled statistical data could be put are too well known and too numerous to demand great elaboration or defense. The preceding examples are given only to indicate some of the uses which could be made of the data suggested in Appendix B.

There is almost no branch of medicine or sociology with which Epidemiology does not more or less concern itself. In the foregoing pages it has been possible to touch the borders of only the few of them which seemed most important in connection with epidemiological work in the army. Some of the measures advocated in this paper have already been put into effect or are noe under consideration. Increased facilities for epidemiological studies have been made available by the War Department in recent years and far greater developments may be expected in the near future.

The Army Division, in time of peace, affords a unique field for studies in Epidemiology. The entire ppulation is numbered and catalogued. The field is large enough to make the findings significent and small enough to make them accurate. Experiments can be commenced on a small scale and afterwards expanded or discontinued, as their respective merits warrent.

The institution of much of the newer work would entail additional labors for the Medical Department, but it is believed that this would be justified by the results. The investigations would not only be of benefit to the army, but could be made useful contributions to the science of Preventive Medicine.

Summary.

I There is a need for a Department of Epidemiology for Army Divisions.

II For the development of additional epidemiological investigations, Medical Officers require additional training in Statistics and Administration.

III The principal duties of the department would be the prompt recognition of outbreaks of disease, the limitation of spread of infections and the recording and study of disease incidence.

IV The Epidemiologist should maintain detailed records of disease incidence and individual records of the status of health of each soldier in the Division.

Appendix --

Report Cards for Notifiable Diseases

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The cards suggesred are 5 x 8 inches. Both sides of the cards are used. Form I is for use in reporting the occurrence of individual infections. Form II is for use in reporting the termination of infections.

Form I
(Obverse)

Disease ---------------------------

Name -------------------------- Rank ---------- Organization ------------

Age ------- Race ---------- Occupation or duty ----------------------------

Date of enlistment ----------- Date of joining station -------------------

Date of onset ---------------- Date of isolation ------------------------

Location (house, barracks, tent, hospital, isolation ward &c. ------------

-- ---------------------------

Previous attacks (dates) --

Other cases in company ---------- Station --------- Neighboring town ------

Recent absences on pass or furlough ------------------------------------

Source of milk supply ---

Suspected source ----------------------------- --------------------------

Preventive measures, instituted and contemplated -------------------------

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Form I
(Reverse)

Immediate contacts

Name	Organization	Nature of Contact	Dates of contact	Isolated or not isolated

Contacts with other organizations

Name of Organization	Nature of contact and date

Form I I
(Obverse)

Disease ------------------------

Name ------------------------- Rank ---------- Organization -------------

Age -------- Race ---------- Occupation or duty ------------------------

Date of enlistment -------------- Date of joining station ---------------

Date of onset ---------- Date of isolation -------- Date of discharge ------

Nature and dates of complications --

Condition on discharge --- ----

Source of infection --

------------- ------------------- -----------------------------------

Form II
(Reverse)

Contacts developing the disease (name, date and circumstances) ---------

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Remarks (Control of spread, special treatments, and developments of interest)

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Appendix B

Indididual Health Record

General Instructions.

I The Surgeon of an organization will maintain an Individual Health Record of each officer and enlisted man within that organization.

2 The Health Record will be opened by the Medical Examining Officer; for enlisted men at time of enlistment and for officers, at time of joining the service.

3 Concise descriptions of changes affecting the health of the soldier, such as sickness, injury, vaccinations, special medical treatments, changes of station &c will be entered at the time of occurrence. Dental treatments will be entered by the Dental Surgeon . Changes in height, weight and chest measure will be recorded when observation is afforded.

4 A transcript of changes in Health Records will be transmitted to the Division Surgeon, on the last day of each month.

5 Upon the transfer of a soldier to other station or hospital, his Health Record will be forwarded with his Service Record.

6 Upon the discharge or death of a soldier, the Health Record will be forwarded to the Division Surgeon.

Nationality of father --- -------------

Nationality of mother ----------- -----

Health of father---- ----- -------

Health of mother---- ---------------

Health of brothers --------------------- Health of sisters --------------

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Known ill-health, past or present, of other relatives

Syphilitic Register

(History of infection and course,and record of treatments, according to the form now in use in the army)

Dental History (Desired form to be supplied by the Dental Surgeon)

Additional Notes

(About 15 blank pages, 4 x 8 inches)

(To be filled in, on entering the service.)

Name -- Number ---- Race ---------

Rank and Organization	From	To
--------------------	---------	--------
---------------- ----	------- --	---------
--------------------	----------	---------

Date of birth ---------------------------- Place of birth ----------

Previous Places of Residence

Name of town ----------------	Population -------------	From ---- To ----
-------------	--------------	----------------
--------- ------	----------- --	----------------
--------------------	---------------	--------------

Previous Occupations

Name of Occupation ------------------	Place ----------	From ---- To -----
--------------	---------------	-------------------
-----------------	--------------	-------------------
--------------------	---------------	------------------------

Previous illnesses (Measles, Mumps, Scarlet Fever, Typhoid and other diseases, particularly acute Infections)

Disease or Injury ----------------------------------	Dates, inclusive ------------
---------------	---------- -------------------
------------------	------------------ ------------
---------------------	--- ----------------------------